1. A method of determining range of a radar target comprising:
receiving signal samples based on returns of a target during tracking;
processing the signal samples to produce a wideband envelope range estimate for components of target motion comprising precession and spin motion components;
measuring the signal samples to produce ambiguous phase values; and
using each wideband envelope range estimate and ambiguous phase value to produce an unambiguous phase value indicative of range.

2. The method of claim 1, further comprising:
determining an estimate of ballistic trajectory for the signal samples; and
removing the estimated ballistic trajectory during processing.

3. The method of claim 1 wherein processing operates at a sampling rate that is at least twice the frequency of the spin motion components.

4. The method of claim 2 wherein using comprises:
subtracting the measured ambiguous phase from the wideband envelope range estimate to produce an error value associated with the wideband envelope range estimate; and
subtracting the error value from the wideband envelope range estimate to give the unambiguous phase value.

5. The method of claim 4 further comprising:
determining a magnitude of the error value and
adjusting resources of a radar system that performs the tracking to ensure that the magnitude of the error is less than a one sigma error.

6. The method of claim 5 wherein the radar system resources comprise signal-to-noise ratio.

7. The method of claim 6 wherein the radar system resources further comprise data rate.

6. The method of claim 4 wherein processing comprises:
producing a spectrum of wideband envelope range estimates from the signal samples;

transforming the wideband envelope range estimates to obtain a spectral estimate of each motion component of precession, spin, spin plus precession and spin minus precession;

detecting each motion component;

estimating amplitude, frequency and phase for each motion component spectral estimate; and

forming a sinusoid in range motion from the estimate of amplitude, frequency and phase for each motion component spectral estimate.

7. The method of claim 6 wherein processing occurs in batch mode for signal samples obtained during several cycles of precession motion.

8. The method of claim 6 wherein the signal samples comprise pulses and using further comprises:

using the sinusoid in range motion to determine an integer number k of cycles in phase change between the pulses.

9. The method of claim 8 wherein using further comprising adding $2\pi k$ to the measured ambiguous phase value prior to subtracting the measured ambiguous phase value from the wideband envelope range estimate.

10. An apparatus for determining range of a radar target comprising:

a stored computer program in memory instituting the steps of

processing the signal samples based on returns of a target during tracking to produce a wideband envelope range estimate for components of target motion comprising precession and spin motion components;

measuring the signal samples to produce ambiguous phase values; and

using each wideband envelope range estimate and ambiguous phase value to produce an unambiguous phase value indicative of range.

11. An apparatus for determining range of a radar target comprising comprising:

means for processing the signal samples based on returns of a target during tracking to produce a wideband envelope range estimate for components of target motion comprising precession and spin motion components;

means for measuring the signal samples to produce ambiguous phase values; and

means for using each wideband envelope range estimate and ambiguous phase value to produce an unambiguous phase value indicative of range.

12. A system comprising:

a transmitter/receiver to direct transmit signals to and receive return signals from a target;

a processor to process the return signals as in-phase and quadrature samples to produce angle information and range signals;

a tracker to track a target detected according to results of the processing by the first processor, the tracker measuring range data during tracking and estimating a ballistic trajectory therefrom; and

a unit operable to use a wideband envelope range estimate of the in-phase and quadrature samples, the ballistic trajectory estimate and an ambiguous phase measurement of the in-phase and quadrature samples to produce a range measurement that is unambiguous in phase.